ARROWHEAD

COMBAT DEVELOPMENTS COMMAND

Commander's Call

THE SEVEN PARAMETERS OF COMBAT DEVELOPMENTS

The task of designing the Army of the future is extremely complex. In fact, there are seven parameters, all interrelated, that influence the design. First, our Army has many missions, more missions than any other army in the world. We must look to the internal security or domestic tranquillity of the fifty states, the stability of the Western Hemisphere, worldwide contingency missions, and the defense of Western Europe. Second, the geographical extension of our missions means that we must be prepared to fight in multi-environments, in a wide range of geographical, meteorological, and sociological conditions. Third, the six combat functions (intelligence, maneuver, firepower, logistics, personnel, and control) force us to look at the sequence of combat itself to see whether in the aggregate they are right for each basic branch and echelon of command. Fourth, the needs of sixteen basic branches, which are the institutional elements that drive the Army, must be fully understood. Fifth, the thirteen echelons of command from the individual SOLDIER up to international operations represent career advancement but, more than anything else, they raise questions about span of control and cost. Sixth, there are three time frames to consider. We see a short-range Army, documented in terms of the defense budget. The mid-range Army would contain things like the new main battle tank and the new attack helicopter. The long-range Army of the 1990's would contain technological and sociological projections that very definitely impact on the mid- and short-range Army. Seventh are the six processes and products of combat developments; namely, analytical studies, field experiments, doctrine, organization, materiel requirements, and operational tests.

With so much at stake, we cannot afford to work in isolation, considering only part of the problem. We must master these factors and make them work together in influencing the design of our Army. Success in meeting this challenge will affect the SOLDIER of the future -- his preparedness and his success on tomorrow's frontier!

JOHN NORTON
Lieutenant General, US Army
Commanding

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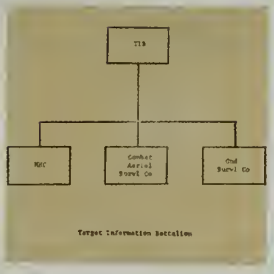

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ARROWHEAD

COMBAT DEVELOPMENTS COMMAND

October 1972 No. 44

ARTICLES

REGULAR FEATURES

PICTURES CREDITS: All photos, U.S. Army photos.

ABOUT THE COVER: Front, Aspects of the changing communications field are depicted in this line drawing. Computers, photography, and personnel are vital parts of today's communications. On page two, comunications then and now are discussed.

Back, This line drawing depicts all the aspects of the modern battlefield—from computers to the Individual Soldier.

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COMMUNICATIONS THEN AND NOW... 28 YEARS OF CHANGES

By Major David S. Price, Captain Marvin B. Cardon, and Sergeant First Class David L. McDonald.

It has been said that there is nothing so constant as change! This has never been truer than in today's Army. One might observe that since 1944, we have witnessed and lived through a Darwin-like development of the tactical Signal Corps. Today's tactical communicator has evolved directly from the nature of the combat force he supports. Combat Divisions today bear little resemblance to their ancestors which rolled across Normandy, clawed their way up the mountainous spine of Italy or island-hopped across the Pacific. Even the names of the evolutionary organizations highlight this development—Triangle, Square, Pentomic, ROAD, ROCID, AIM, Airmobile, ASTRO, and TRICAP. Because of the rapidly changing mission and organizational structure of the division since 1944, the missions and communications requirements placed on division communications elements have also changed.

QUANTITATIVE COMPARISONS 1944–1972

The infantry division today operates over a much larger area than ever before. In 1944 a division was deployed over a front of 5–10 miles; in 1972 the division is organized, equipped and supported to operate over fronts of 25 miles and larger, a 500 percent increase. Technological advances in air and ground mobility, improved weapons systems, and particularly communications have provided the division with this capability for increased area coverage (fig. 1). Concurrent with the changing structure and employment of the infantry division, a concept of "signal centers" has evolved. Where signal centers were once separated by 4 or 5 miles, they now average more than 25 miles apart, a growth of more than 500 percent. Today's commander and staff have a sophisticated system of signal centers for command and control and administration and logistics which their predecessors did not have in 1944.

Sheer numbers of C–E related personnel and equipment have increased sharply from 1944 to 1972. During World War II (WWII), less than 2 percent of the infantry division personnel had C–E missions, but by 1972 the figure has risen to 17 percent. At the beginning of WWII, there were approximately 1,000 pieces of electronic equipment in the division; by the end of the war, the number had risen to about 1,400. To-

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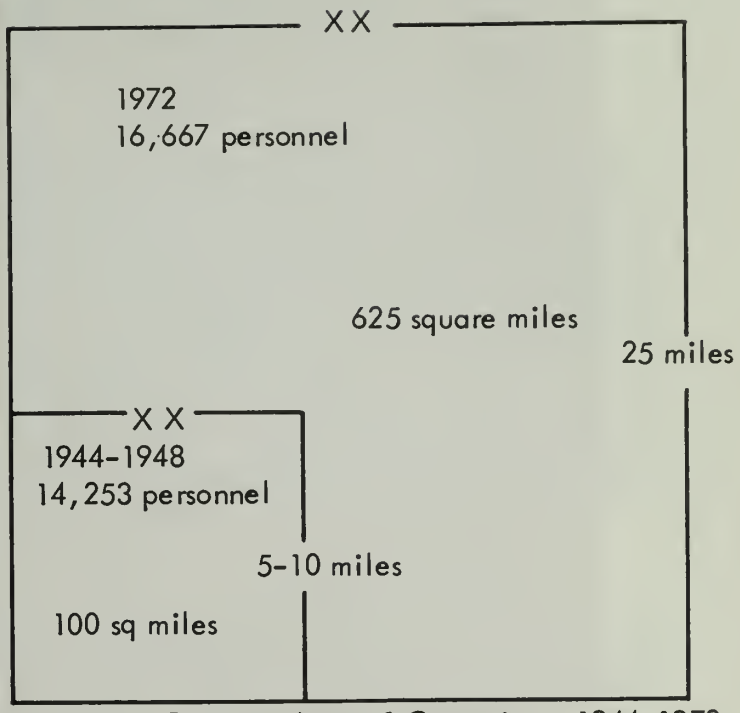


Figure 1. Division Area of Operations, 1944-1972

day the division contains over 4,000 pieces of electronic equipment.

The number of signal-oriented personnel in a division, exclusive of the signal battalion, has drastically increased as voice radio and radio teletypewriter capabilities have become more widely used in maneuver and support units. Since 1966, communications personnel for these units have been provided from Signal Corps assets. In the past, battalion level "Commo" officers were non-Signal Corps officers who, occasionally, were appointed to the job as an "additional" duty; "walking wounded" Soldiers were often detailed to install field wire and light cable for the unit field telephone system or to operate radios. Today, MOS-qualified signal personnel are employed in these units, thereby enhancing the responsiveness and reliability of unit communications.

The increase in skilled communications personnel in the division over the years since WWII has been directly influenced by the requirements of field commanders, forward strides in electronics technology, and the exigencies of modern warfare. While the number of C–E personnel in the division has grown, the services provided have expanded at an even greater rate. Figure 2 dramatically illustrates this fact. In 1944 the ratio of C–E personnel per channel of communications provided was *2.3;* this ratio peaked in 1948 at *3.7*, while in 1972 it is only *1.4*.

COMMUNICATIONS CAPABILITIES TODAY

Communications available to the field commander today bear little resemblance to those of the 1944–1948 era. In 1944 the division had two field wire lines for telephone communications between echelons, and a simplex teletypewriter circuit, crude by today's standards, but effective at the time. In 1972, commanders can rely on a multiplicity of means for communications in any direction, including "straight up" to airborne command posts.

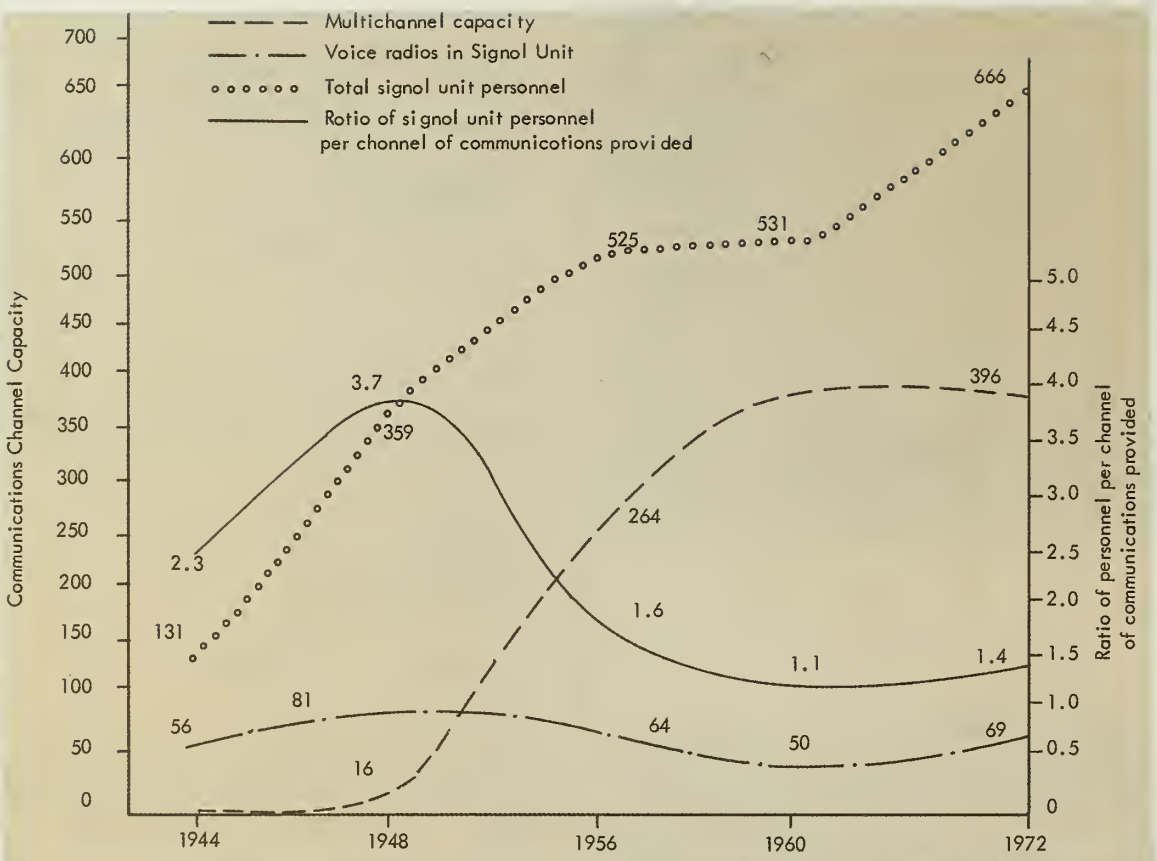


Figure 2. Grouped Trends; Signol Battalion Personnel and Chonnels of Communication Provided

COMSEC

Quantum leaps have occurred in the employment of communications security (COMSEC) devices and materials. In 1944, COMSEC and cryptographic supplies, equipment and maintenance were limited; today they are a critical part of the communications effort.

Our present division signal battalion installs, operates and maintains secure record communications facilities. High-speed teletypewriter circuits with on and off-line crypto capability are commonplace in the field today. In addition, secure radio teletypewriter provides a highly mobile capability for transmitting and receiving "hard-copy" record communications from almost any point in an area of operations back to any echelon. The extension of the automatic secure voice communications (AUTOSEVOCOM) telephone system down to the division in Vietnam, for example, allowed commanders and staffs to exchange classified or sensitive tactical information and respond to situations more rapidly than ever before.

Perhaps one of the most dramatic events in division communications was the introduction, down to the lowest level, of TSV-tactical secure voice. Paralleling the growth of FM radios, the utilization of TSV in Vietnam enabled tactical commanders to directly influence the conduct of combat operations. During WWII, tactical instructions were subject to disclosure to the enemy by tapping unsecured telephone lines, monitoring radios and by physical interception of ground messengers. Of course, as equipment becomes more sophisticated, maintenance and logistical support problems multiply. Division signal battalions operate maintenance facilities

and exercise supervision over distribution, control, and inventory for all division units employing COMSEC equipment and materials.

TELEPHONE

In 1944, division command echelons relied on two field wire telephone circuits direct from each regimental command post; today the commander at any echelon of the division has multiaccess, multimeans for communications in any direction. Switchboards have increased in number in the division from 30 in 1944, with a capacity of 6–40 lines, to 144 in 1972 offering capacities of 6–120 lines. Means for circuit switching and patching have been developed to provide even greater flexibility. The division of today requires a complex telephone system consisting of dedicated and common-user (CU) circuits. The capability of switching and crosspatching high-priority dedicated telephone circuits is one of the most significant means of maintaining continuity of voice communications. This same capability also exists for division teletypewriter circuits. New generations of telephone switching equipment, such as the cordless switchboard (AN/TTC–23 and AN/TTC–29) will continue to increase reliability and responsiveness to users of division telephone systems.

MESSENGER–PIGEONS TO HUEYS

Until 1960, messenger services in the division were limited primarily to ground messengers. Throughout WWII, and even into the late 1950's carrier pigeons were utilized. Today, messenger service has been expanded to include air messenger services, both scheduled and unscheduled, utilizing organic aircraft of the division aviation battalion. From a force of 4 men in 1944, the division signal battalion can now employ up to 18 men in messenger services.

AUDIO–VISUAL

In 1944, the division did not have an organic photo capability. Combat photographers were provided from Signal Corps assets pooled at higher echelons. Today there are a variety of audio-visual communications aids available to the division. Signal battalions may have still photography laboratory facilities for immediate processing of film shot by organic photographers. Personnel identification cards, passports, military police identification, and accident and criminal investigation are but a few of the many applications of photographic aids available to the division. In addition, augmentation by Signal Service Organizations (TOE 11–500 cellular teams) can provide motion picture services to the division.

VOICE RADIO

The primary means of communications in 1944 was field wire, augmented by a very limited number of radios for extremely austere command and control purposes. A type infantry division today carries nearly 3000 voice radios. Within the infantry battalion alone, voice radios have increased from 22 to 175 since WWII. Late in WWII, there were 44 separate voice radio nets operating in the division, while today, there are over 300 voice radio nets (FM and AM) which could be in operation at one time. Figure 3 illustrates this increase in utilization and concurrent decrease in the ratio of C–E personnel required per net. The increased availability and reliability of FM (frequency modulation) radios throughout the division has contributed to the increase in number of radio nets. Used in conjunction with speech security devices, tactical secure voice radio has played an important part in the refinement and development of new combat techniques.

The effort to support the increased usage of voice radios, including maintenance, logistics and communications administration, has heightened the need for well-trained, technically proficient officers and noncommissioned officers. Radio systems planning, engineering, and frequency management alone require the full-time assignment of an officer and two or three enlisted men within the Division Signal Office.

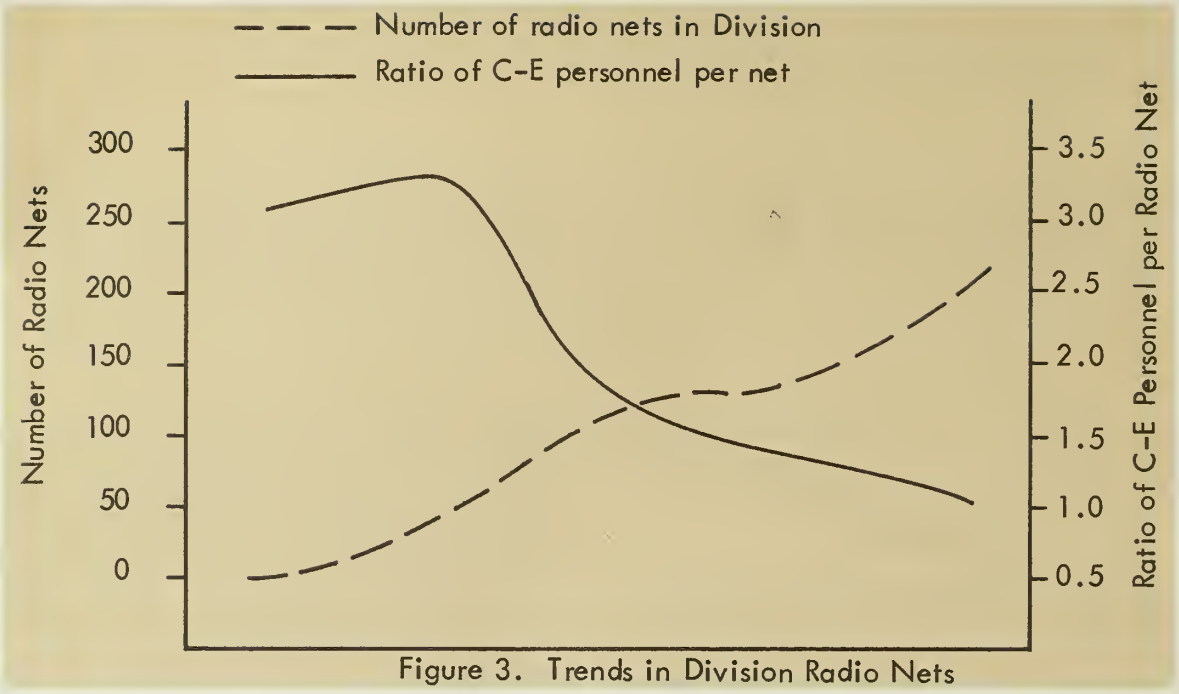


Figure 3. Trends in Division Radio Nets

MULTICHANNEL RADIO

The backbone of communications in the field today is the multichannel radio system. Where the commander in 1944 was limited to two field telephone circuits and a handful of voice radios, his successor today has upwards of 400 channels of communications available. The multichannel systems provide high-quality communications links for a variety of uses, including common-user and dedicated telephone circuits, high-speed teletypewriter, data and computer circuits, and facsimile, AUTOSEVOCOM, and TV circuits.

When the backbone (multichannel system) is connected to circuit switching and patching facilities, and telephone and teletypewriter switchboards, a vibrant and viable communications complex is created. Augmented by mobile radio teletypewriter assemblages and supplemented by voice radios, the division communications system offers a multiplicity of means from the highest to lowest level, with almost 100 percent reliability. The variety of services provided gives to combat commanders a communications flexibility never before possible.

The communications system, its capabilities, and services just described, has some minuses associated with it. The increase in numbers of electronic equipment items alone requires an increase in C–E oriented personnel. As electronic equipment becomes more versatile in terms of capabilities, it concurrently increases in complexity. Schooled-trained, MOS-qualified personnel are necessary for operation and maintenance to today's sophisticated communications equipment. However, continued application of state-of-the-art technology may result in operator reductions, while holding the line in the maintenance and logistics channels.

FOREIGN SIGNAL UNITS

A study of signal support organizations of foreign armies shows that they are also making increased use of electronic means of communications and, in nearly every case, they utilize a greater number of personnel to provide equivalent (or less) signal services. With respect to

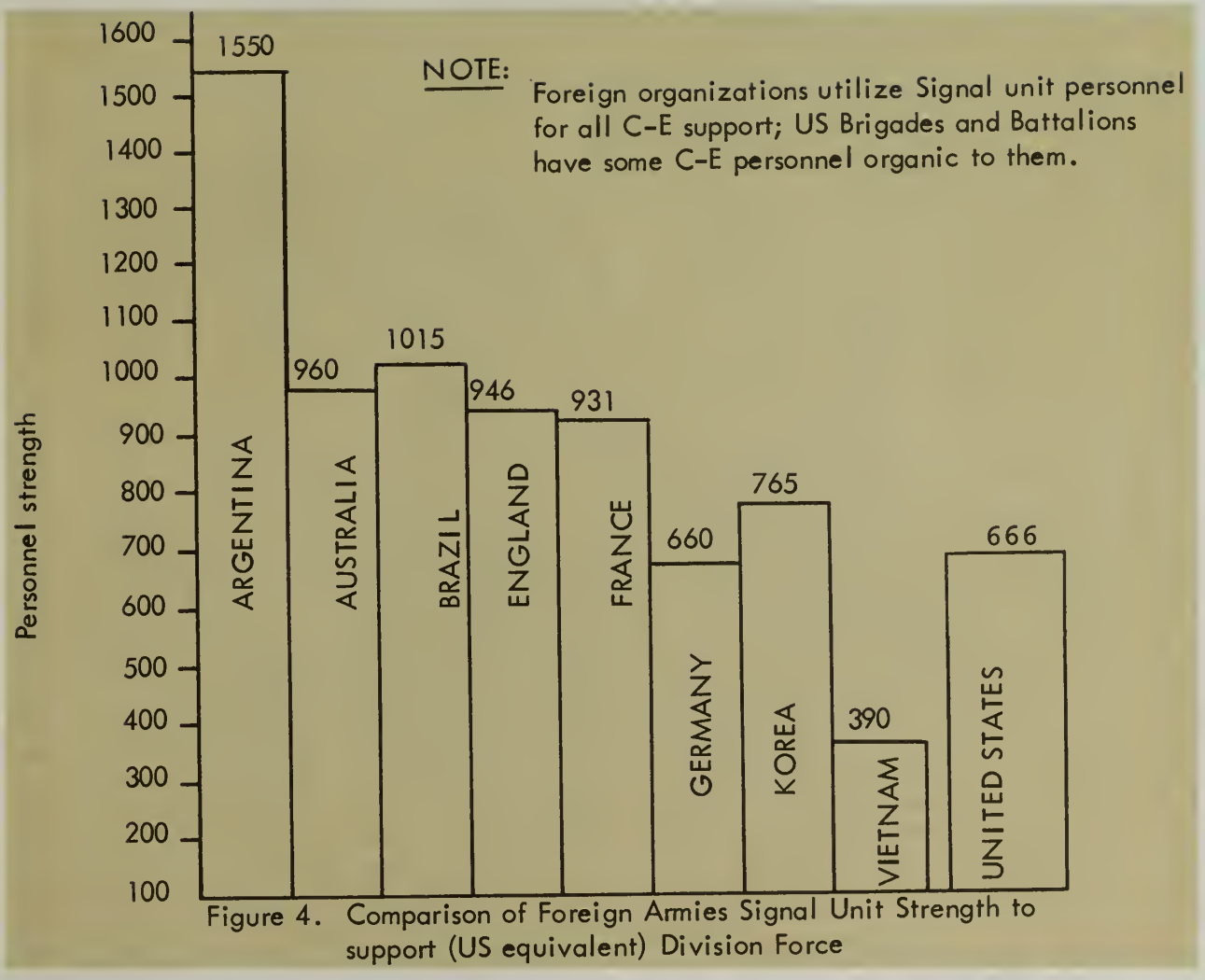


Figure 4. Comparison of Foreign Armies Signal Unit Strength to support (US equivalent) Division Force

the size of signal battalions (or their equivalent) of foreign armies, a glance at their organizations for support to a unit comparable to a US Army division (16,667 men) shows the US in a very favorable light (fig. 4). In Germany, for example, the signal unit contains 600 officers and men, with additional personnel organic to brigades. However, the signal unit does not provide long-lines communications, but relies on the civilian Bundespost for leased services. Argentina fields 1550 men in support of a 15,000 man corps, made up of the corps headquarters and three brigades. Their multichannel capability is limited to 4–channel multiplexing systems, in contrast to US standard equipment with up to 24 channels. In the British Commonwealth countries we find a signal regiment with three signal squadrons, totaling 946 officers and men in support of a division, again with the 4–channel multiplex as standard equipment.

IMPACT OF TECHNOLOGY ON DIVISION COMMUNICATIONS

Full-duplex teletypewriter, increased multichannel capabilities, on-line cryptographic transmission, and radio teletypewriter have reduced message handling time and decreased backlogs and delays. However, the speed and ease with which messages can now be handled has encouraged (not unexpectedly) an ever-increasing load of reports and messages from various staff and command.

As communications-electronics technology has leaped forward, commanders have become infinitely more cognizant of what is possible and what may be made available to them to achieve real-time information affecting the accomplishment of their mission. They, in turn, have increasingly exerted pressure on the communicator to provide the means (men and equipment) to make the "state-of-the-art" a part of their inventory.

The need for dispersion and mobility, and the necessity of the combat division to maintain a state of readiness to "shoot, move and communicate" have combined to dictate the communications effort, and the type and numbers of professionally competent communications personnel. The 80 percent mobility criteria for C–E equipment has generated a significant increase in the number of vehicles required in the division signal battalion and simultaneously has increased the maintenance and logistic support requirements.

In absolute terms, size and scope of the division C–E effort is considerable. However, relative to foreign armies and services provided, the C–E effort is considerably more efficient and economical in personnel and equipment commitments.

DIVISION COMMUNICATIONS IN THE FUTURE

In further planning for the division of the 1980's, the Army has approached the problem of improving tactical command and control capabilities with integrated Battlefield Control Systems (IBCS). The objective, of course, is to provide the ground force commander with an increased capability for planning, directing, and controlling combat operations. As the Army moves toward fielding the IBCS, organizations and operations will be supported by tactical data systems using high-speed computers. As with the advent of any new system and its capabilities the introduction of IBCS will undoubtedly generate changes in communications concepts and doctrine.

SATELLITE

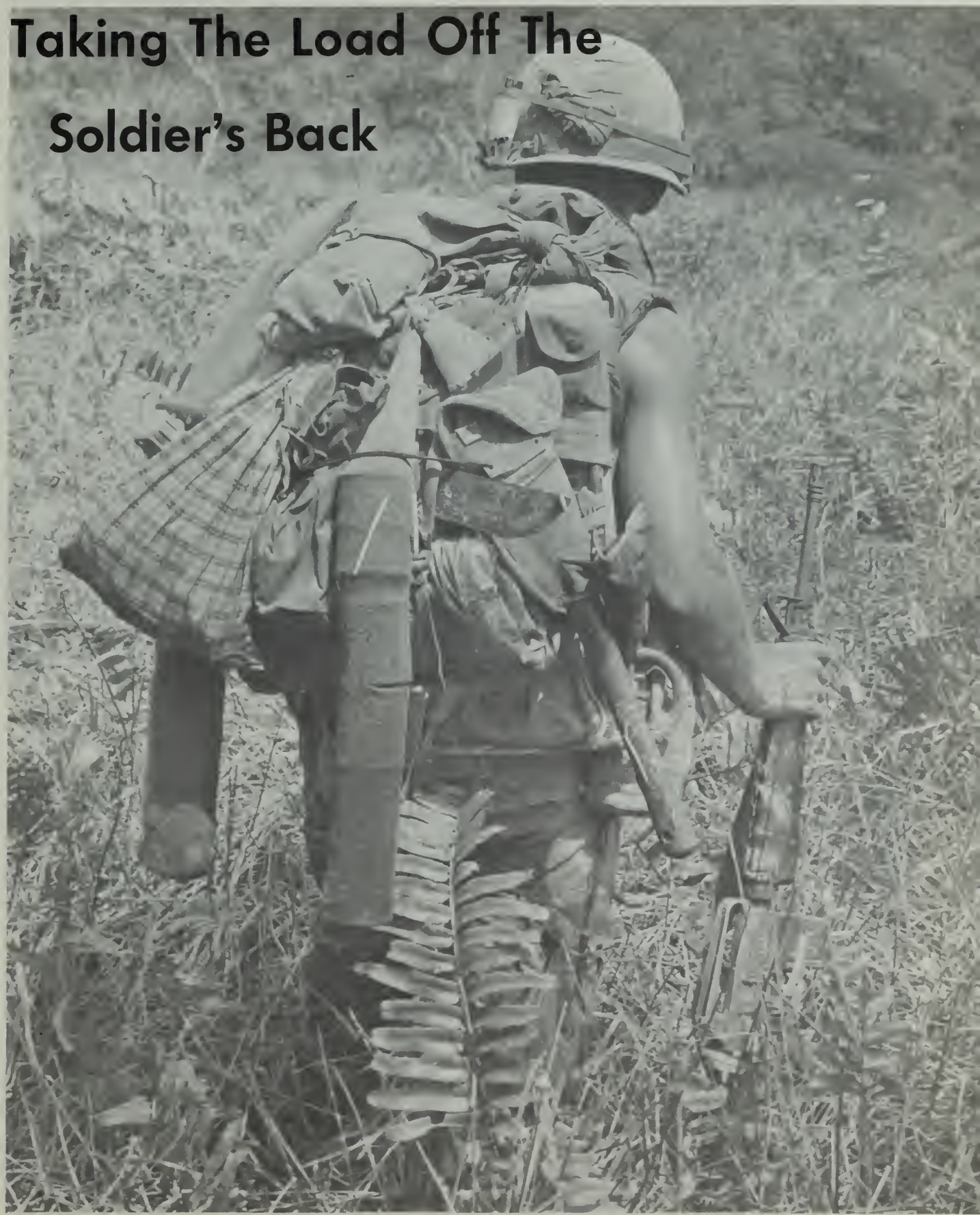
Another step forward will be taken when a tactical satellite communications system is fully realized. TACSAT systems will overcome range limitations of conventional line-of-sight (LOS) systems and provide greater reliability and quality in long-haul, multichannel communications.

TELEVISION

In the not-too-distant future, the division will be able to exploit television. Equipment and employment techniques are being investigated for applications to live coverage of combat operations, live telecasts from reconnaissance aircraft, and sentry and surveillance systems. The introduction of compact recording and playback systems will permit filming of individual and unit training with immediate playback for critiques and corrections. The "instant replay" application to such areas as squad maneuvers, for example, is generating an entirely new concept in military training. Invesigation of TV applications to training films has also stimulated much interest. The advantages accrued in the editing process, and the ease of using such techniques as stop-action, slow motion and animation appear to be limited only by the imagination of the users.

The division today can communicate further, via more means, with more reliability than ever before. If three eras were compared—WWII, the present, and the 1980's–1990's, we would, today, be in the early stages of the communications equivalent of the "Industrial Revolution." Further applications of space-age technology to military communications will continue to improve upon the best communications support to the combat Soldier available anywhere in the world. One day perhaps, the ground commander may communicate by video-phone, over a laser beam, relayed through a satellite—Shades of Buck Rogers!

Taking The Load Off The Soldier's Back



By Major Douglas M. Hughes

The foot Soldier in all armies throughout history has carried extremely heavy loads into battle. Even in today's US Army, with its sophisticated, lightweight equipment, the rifleman is required to carry weights on his back which are literally staggering. What can be done about this? Why not develop an Infantry battalion with a rifle company which contains only man-portable equipment and assign all other equipment to battalion level from which it can be brought to the riflemen on an as-required basis?

These questions were raised by the Vice Chief of Staff at the Combined Infantry Aviation Review held at Fort Benning, Georgia, in November 1971. The USACDC Infantry Agency was tasked to study this problem. The Restructured Infantry Battalion Study, or RIBS, resulted from this tasking.

The first and most obvious step in approaching this problem was to consider removing from the rifle company all items of equipment that are not man-portable—in other words, according to the Army Dictionary of Terms Definition: "Items which are designed to be carried as a component part of individual, crew served or team equipment for the dismounted Soldier in conjunction with his assigned duties. Upper weight limit approximately 30 pounds." This step resulted in the reduction of the heavier items of equipment such as vehicles, field safes, and tentage. However, the remaining items, while individually man-portable by definition, are not necessarily man-portable when several items have to be carried by one man. A relatively lightweight piece of equipment of 20 pounds could prove to be the straw that breaks the Infantryman's back when added to the load of a Soldier already carrying several other 20-pound items.

In a study completed by the Infantry Agency and approved by Headquaters, Department of the Army, in 1964 (A Study to Conserve the Energy of the Combat Infantry man), it was determined that an Infantryman can carry approximately 40 pounds while fighting and 55 pounds while marching and still be effective in either situation. To approach the weight loads in the RIB study, it became obvious that a "man-portable" rifle company can become a reality only by taking an extremely austere posture and assigning to this size unit only those items considered essential to perform its primary mis-

Major Hughes is assigned to the CDC Infantry Agency at Ft. Benning, Ga.

CLOTHING WORN BY SOLDIER

(lbs.)

BOOTS, LEATHER COMBAT	3.75
UNIFORM, COMBAT, TROPICAL	2.96
UNDERWEAR	.47
SOCKS	.10
BELT	.20
HANDKERCHIEF	.06
TOTAL CLOTHING	7.54

FIGURE 1

FIELD EQUIPMENT WORN BY SOLDIER (lbs.)	
STEEL HELMET W/COVER AND LINER	3.67
PISTOL BELT, SUSPENDERS, CANTEEN, FIRST AID POUCH ETC.	6.52
MASK, PROTECTIVE	3.00
INTRENCHING TOOL	2.50
RIFLE CLEANING KIT	1.00
ARMORED VEST	8.76
NECKLACE, ID TAG	.03
PERSONAL ITEMS	1.00
TOTAL FIELD EQUIPMENT	26.48

FIGURE 2

sion. The daylight attack was selected as a basic mission for the company; all other missions were considered special cases. All equipment not essential to the daylight attack was then removed from the rifle company and moved to the headquarters company. Because the supply sergeant, supply clerk, armorer, company clerk, and radio mechanic are not required in the daylight attack, these personnel were moved to the headquarters company and formed into company suport teams. These teams will habitually support the rifle company from which they were removed. They will, in addition to their normal functions, maintain the equipment transferred from the rifle company and, using the vehicles transferred from the rifle company to the headquarters company, transport that equipment required in special situations by the rifle company. For example, prior to a night operation, STANO devices would be delivered by the company support team to the rifle company.

The equipment remaining in the rifle company was then distributed to the members of the rifle company in three type loads: the assault load, subsistence load, and the approach-march load. These type loads are defined as follows:

Assault Load: That load which is required for the individual Soldier to conduct an assault upon an enemy position. This load includes individual clothing, (See Figure 1), field equipment, (See Figure 2), individual weapon and basic load and other mission essential equipment such as radios, compasses, and grenades.

Subsistence Load: That load which is required for the individual Soldier to live in the field but which is not essential in the assault. This load includes extra clothing, poncho, sleeping equipment, and other similar items. (See Figure 3)

Approach-March Load: That load carried in the approach march, normally consisting of the assault load, the subsistence load, and mortar ammunition.

The average weights to be carried by the members of the rifle company after distribution of all equipment are 63.7 pounds in the assault and 103.4 pounds while in the approach-march. The ammunition bearer is carrying the most weight (89.22 pounds in the assault and 118.54 pounds in the approach march) while the rifleman is carrying the least (48.62 pounds in the assault and 82.77 pounds in the approach-march) (See Figure 4).

SUBSISTENCE LOAD

(lbs.)

RUCKSACK	2.89
EXTRA CLOTHING	4.60
SLEEPING BAG	10.00
MESS KIT	.56
SHELTER HALF	4.00
PONCHO	2.60
AIR MATTRESS	2.90
1 - "C" RATION MEAL	1.77
TOTAL SUBSISTENCE LOAD	29.32

FIGURE 3

Obviously these weights are substantially above those of 40 pounds in the assault and 55 pounds in the approach-march as recommended in the 1964 "Energy" study. In an attempt to further reduce the loads to be carried, a second alternative was developed. In this alternative, in addition to the steps taken in the first alternative, the 81mm mortars and 90mm recoilless rifles were moved, with their crews, to the combat support company. Even with the reduction of these weapons and their basic load, the average weights to be carried by the members of the rifle company hold at 62.2 pounds in the assault and 91.5 pounds in the approach-march. The machine gunner is carrying the heaviest load of 85.02 pounds in the assault and 114.34 pounds in the approach-march, while the lightest loads are carried by the rifleman: 48.62 pounds in the assault and 77.94 pounds in the approach-march. (See Figure 5.)

Because the weights to be carried in both alternatives are significantly above those recommended by the "Energy" study, it was recommended that the Infantry battalion not be restructured at this time and that emphasis be placed on the development of future lightweight equipment.

As a result of this RIB study, a follow-on study was undertaken by the Infantry Agency to determine if more innovative and austere actions could be taken to develop a rifle company which contains only man-portable equipment and in which the individuals assigned could carry loads which approximate those recommended by the 1964 "Energy" study.

As a first step, the amount of equipment to be carried by members of the rifle company was further reduced by applying the most austere rationale possible. For example, the Armored vest, rucksack, extra clothing, sleeping bag,

Continued on page 14

FIGURE 4 - ALTERNATIVE 1 LOADS (LBS)

	ASSAULT	SUBSISTENCE	APPROACH-MARCH
HEAVIEST LOADS (AMMUNITION BEARER)	89.22	29.32	118.54
AVERAGE LOADS	63.7	29.3	103.4
LIGHTEST LOADS (RIFLEMAN)	48.62	29.32	82.72

FIGURE 5 - ALTERNATIVE 2 LOADS (LBS)

	ASSAULT	SUBSISTENCE	APPROACH-MARCH
HEAVIEST LOADS (MACHINCE GUNNER)	85.02	29.32	114.34
AVERAGE LOADS	62.2	29.3	91.5
LIGHTEST LOADS (RIFLEMAN)	48.62	29.32	77.94

FIGURE 6 - FOLLOW-ON STUDY LOADS (LBS)

	ASSAULT	SUBSISTENCE	APPROACH-MARCH
HEAVIEST LOADS (MACHINE GUNNER)	74.64	------	84.14
AVERAGE LOADS	48.5	------	58.3
LIGHTEST LOADS(RIFLEMAN)	39.95	------	51.93

shelter half, and air mattress, carried by the individual Soldier in RIBS, are now assigned at battalion level and must be delivered to the rifle company on an as-required basis.

The Soldier is now carrying his rations and poncho in the assault load and has no requirement to carry a subsistence load as in RIBS. Next, the company lightweight mortar was substituted for the 81mm mortar at company level. Through these steps and using an expanded company support team in headquarters company, the weights to be carried by the rifleman were reduced to below the 40-pound goal in the assault (39.95 pounds) and below the 55-pound goal in the approach-march (51.93 pounds). It should be pointed out that the average weight to be carried is 48.5 pounds in the assault and 58.3 pounds in the approach-march with the machine gunner carrying the heaviest load of 74.64 pounds in the assault and 84.14 pounds in the approach-march. (See Figure 6)

This examination shows that the rifle company can be organized and equipped so that at least the rifleman can carry his load into battle and still fight effectively. The question of whether this alternative with the austere amount of equipment is more desirable than a company containing more equipment which relies on vehicles to transport its equipment, or which leaves behind much of its equipment, is still unanswered.

The detailed study has shown that planners and commanders will have to take a hard look at any new equipment being developed to insure that the requirement for it justifies the additional weight or that it replaces a heavier item.

ON TARGET WITH THE TIB

By Major William L. Johnson

What's A TIB?

TIB sounds like a commercial product—true—but it is an acronym for *Target Information Battalion.* Still in the conceptual stage, it is one of the approaches being considered to provide the commander with his own organic, fully-integrated capability to satisfy his combat intelligence needs.

In the decades following World War II and the Korean War, the Army made giant strides in the areas of mobility, firepower, and communications. Several other key areas, however, did not keep pace with this remarkable progress. The Army's information collection, processing, and dissemination system remained dormant. The result was an Army that could shoot, move, and communicate over any terrain in any level of warfare, but one that suffered from a startling primary deficiency: the capability of finding the enemy in a timely and accurate manner to permit the most effective use of that firepower and mobility.

The Military Intelligence Company, which presently provides limited intelligence support to the division, is not organized to furnish the amount of information required, within the time frame needed, to make it usable. It does provide counterintelligence, interrogation of prisoners of war, and imagery interpretation support. It also augments the division G2 in the areas of analysis and production, but it does not aid the division G2 or brigade and battalion S2's in coordinating unit information collection efforts or provide the brigades and battalions with analysis and production support. These deficiencies in the intelligence effort are not new. They had been detected in peace-time by analysis and became more and more evident in the early 1960's with a deepening involvement in combat activities.

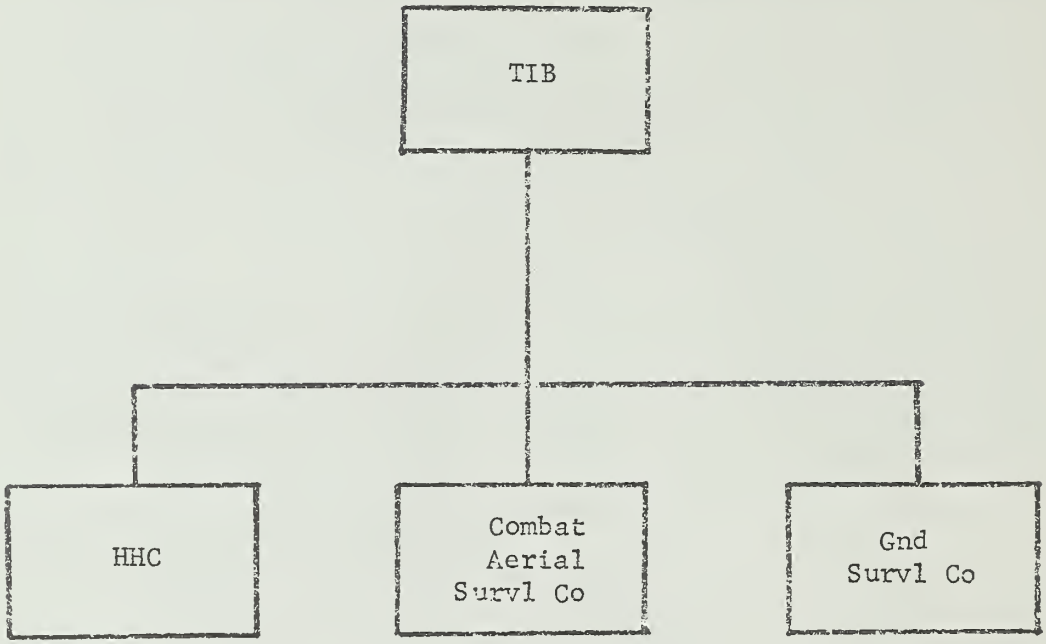
In 1965, the Army intelligence community undertook a major study effort to address the problem, with a strong role played by Combat Developments Command (CDC). The study, entitled Tactical Surveillance and Reconnaissance-1975 (TARS–75), provided insight into the problem and recommended an organizational concept to fill the need. Stateside testing and combat evaluation to date have validated basic concepts of the study and opened the door for the current organizational approach.

The testing and evaluation program, at various stages, looked not only at concepts for an intelligence organization to support a division, but also at a STANO (Surveillance, Target Acquisition and Night observation) aviation company and electronic warfare support. As a result of these efforts, plus recent national–level decisions concerning intelligence organizations and responsibilities added to the forthcoming austerity restrictions, a fact became evident. By combining these concepts into one basic organization, we could provide the best vehicle for *retaining* and *employing* those capabilities required by the combat commander to perform effectively on the battlefield.

This new concept has taken the TARS–75 and STANO aviation company concepts and molded them into an organization which would provide the division commander with both a ground and aerial surveillance capability. It has also provided for interface with the signal intelligence/electronic warfare (SIGINT/EW) support unit. The basic guidelines used in developing this concept:

—give the division commander the *essential* assets required to perform his mission and

Major Johnson is currently assigned to HQ, CDC, Ft. Belvoir, Va.



Target Information Battalion

—provide him with a management and coordination system for *all* information gathering assets in the division.

This is expected to make the information gathering system more responsive to subordinate commanders and reduce and eliminate duplication in the communications.

The TIB, as seen by CDC, is organized into a Headquarters Company, a Ground Surveillance Company, and a Combat Aerial Surveillance Company. The mission is to provide management and specialist personnel and equipment for the collection, processing, and dissemination of combat intelligence information obtained or developed in support of the division. The TIB provides aerial and ground surveillance support in the division to collect information on enemy activities. It provides the unique Battlefield Information Coordination Center (BICC) at division level to coordinate the collection effort, analyze information, and produce and disseminate intelligence. Elements of the TIB are capable of interpreting sensor and photographic imagery, performing short- and long-range attended ground sensor surveillance, and unattended ground sensor monitoring.

The commanding officer of the TIB exercises immediate control over the operational elements of his battalion, specifying the use of intelligence specialists of his battalion during all phases of operation. He is responsible for the planning, training, coordination, and control of all operational administrative activities of the battalion. He is the principal advisor to the division G2 on the technical aspects of intelligence.

The division G2 exercises staff supervision over the division TIB. He assigns objectives, places requirements on the division BICC in the name of the division commander, and furnishes appropriate guidance. The TIB functions for and at the direction of the G2. The G2 is the approving authority for all division BICC activities and the division BICC operates solely to support the G2 in fulfilling his intelligence duties.

The BICCs at brigade and battalion level are organic to these respective headquarters. All BICCs are tied together through dedicated com-

munications networks and, through reciprocal tasking, provide for a ready flow of information up and down the chain of command. Collection assets of the TIB operating in general support of the division submit their acquired information into the intelligence system through the division BICC. Assets operating in direct support of subordinate division units input their information into the BICC of the headquarters that they are supporting.

In addition to making subordinate unit BICCs organic to each headquarters, the TIB concept also has two other major deviations from TARS–75. The Aerial Surveillance Comany provides the division commander with an organic aerial information collection means to supplement and complement his ground collection assets. Also, increased interface of the Division BICC with the SIGINT/EW support unit will insure timely and adequate integration of information collected from all sources.

This unique Aerial Surveillance Company keeps a continuous "eye" on the battlefield through Moving Target Indicator radars on helicopters, through unattended ground sensors, and through the Special Purpose Platoon. The capabilities of the Radar Surveillance Platoon fill the gap caused by terrain masking of the commander's ground systems and also extend the acquisition range well forward.

The Company's Special Mission Platoon's four utility helicopters are dedicated to intelligence missions only, such as delivering and monitoring the unattended ground sensors and special purpose detectors and for emergency service to Long Range Reconnaissance Platoons and the Battalion's Ground Surveillance Radar Teams.

The other "line" unit of the battalion, the Ground Surveillance Company, claims uniqueness because it purports to put ground surveillance under a *central management*. The Short-range Radar, Long-range Radar Platoon and the Unattended Ground Sensor Platoons may work in general support under the Division G–2 or in direct support of maneuver brigades and battalions with their collected information going into the intelligence system via the BICC of the supported unit.

The 12 teams of the Short-range Radar Platoon will generally work directly for the maneuver battalions in the battle area. Here they can provide current data and supplement other devices and techniques such as verifying ground sensor detections with line-of-sight radar. The three target acquisition radars of the Long-range Radar Platoon augment the acquisition functions of supporting artillery, but are still keyed to the Division's surveillance plan. They most probably will work directly for maneuver brigades.

The Unattended Ground Sensor Platoon's 12 teams provide monitoring equipment to "read" the sensors already planted by units they are assigned to support. They assist and technically supervise maneuver unit personnel during sensor implant and perform all read-out following implant.

The Headquarters Company of the TIB is both conventional and unique—conventional in that it provides the Battalion's management and housekeeping functions, but unique also, since it provides for the Battlefield Information Coordination Center. To be successful it must do only two things well: one, manage the division's collection effort and, two, expedite the intelligence "product" to commanders up, down, and sideways in the battle area. Sound simple? Then don't forget that these two jobs have many parts, from determining where to plant sensors and interpreting an infrared imagery report, all the way up to producing an all-source intelligence data base.

With the added capabilities of the Weather Support Section of 14 Air Force technicians, the TIB concept will provide the division commander and staff with a truly integrated combat intelligence capability. Its inherent abilities to task, manage, collect, interpret, and disseminate information and intelligence for the force as a whole will greatly reduce those instances of piecemeal or delayed intelligence with which many of us are familiar. With its integration of formerly diverse concepts into one package, it is also an appropriate step in the austerity direction which, at the same time, provides the commander the bonus of a more complete system. Used properly, CDC feels the system will give the U.S. Army combat leader the capabilities to exploit the firepower and mobility gains that have been made over the years.

SYSTEMIZING AERIAL SURVEILLANCE

By LTC Robert Vance Taylor

EDITOR'S NOTE:
The views expressed here are those of the author and do not represent Department of Army or CDC positions on this subject matter.

What's It All About?

Recent reorganizations within the Intelligence and Control Systems Group, and the Intelligence Agency in particular, have resulted in a new approach to the aerial reconnaissance and surveillance business. Simply stated, the basis for this reorganization has been a systems approach instead of the functional approach used in earlier organizational structures. For the first time for the combat developer, all parties to the problem are in the same office and are now charged with an across-the-board responsibility for all aspects of aerial reconnaissance and surveillance. In essence, the Collection Branch, Combat Intelligence Systems Division, Intelligence Agency conceives/evaluates initial concepts for future systems, translates these concepts into required operational capabilities, provides the doctrine necessary to implement utilization, and follows through the life cycle with the necessary standardization actions and product improvements until the eventual determination of obsolescence.

One might ask, "So what's new about all this? Seems like a logical progression of actions, and haven't reconnaissance and surveillance systems been handled like this all along?" True, it is a logical progression of developmental actions, and yes, the other services have operated their programs in a similar manner. But the simple fact is that the Army has not; its efforts have been splintered. Not only have different Army organizations been involved in parallel actions, but, as has often been the case, separate and seemingly unrelated projects initiated in a single agency have proven to be duplicatory.

Why the Current Emphasis for Change?

For some time there has been a growing awareness of this splintered effort, and it becomes increasingly obvious that our thinking and organizations must be realigned in order to provide the centralized focal point (management, if you please) to organize this effort, to eliminate tangential efforts and to eliminate duplicatory efforts—in short, to initiate and follow through with fully integrated systems designed to meet the combat commanders' needs.

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ALARM–Candidate equipment for the aerial surveillance company.

For various reasons, this year seemed like a particularly appropriate time in which to realign our thinking. The most important reason has been the "wind-down" of the Vietnam conflict and a shifting of emphasis to other types of warfare. Attendant to this "wind-down" is an apparent "breather-spell" during which an appropriate period of time can be spent evaluating a concept or proposal as opposed to the recent past procedure of rushing an item to Southeast Asia without complete evaluation, hoping it would contribute to the combat effort.

Past practices, as well as the changes in focus, have led to the next consideration: proliferation. We now find a considerable number of systems, some under development, some proposed, and some conceptual that attempt to answer some of the Army's requirements. Initial evaluations indicate that some of our requirements may not be met by any of these candidate systems, while other requirements may be duplicated by other systems. Finally, but certainly not the least in importance, is cost. Even the cheapest of the candidate systems will be expensive, and some systems that in all likelihood will prove to be essential will be quite costly. The Army simply cannot afford to spend money on systems that are unnecessarily redundant.

A More Basic Consideration

The need for a total review of past developmental procedures is certainly valid. A more basic consideration that has always been with us in development and equipment employment has been the timeliness of combat intelligence. The capability to collect has generally been greater than the analytical and dissemination capabilities. This problem exists at all levels of intelligence, from the highest national levels down to and including the lowest tactical com-

mander. The Family of Army Surveillance and Target Acquisition Requirements (FASTAR) study, even though not complete, points out a gap in filling the brigade and lower commanders' information needs. Even with data link and its realtime transmission of imagery to a ground sensor terminal, the resultant intelligence information usually cannot be extracted (interpreted) and transmitted to a brigade, battalion, or company commander in sufficient time to meet his needs.

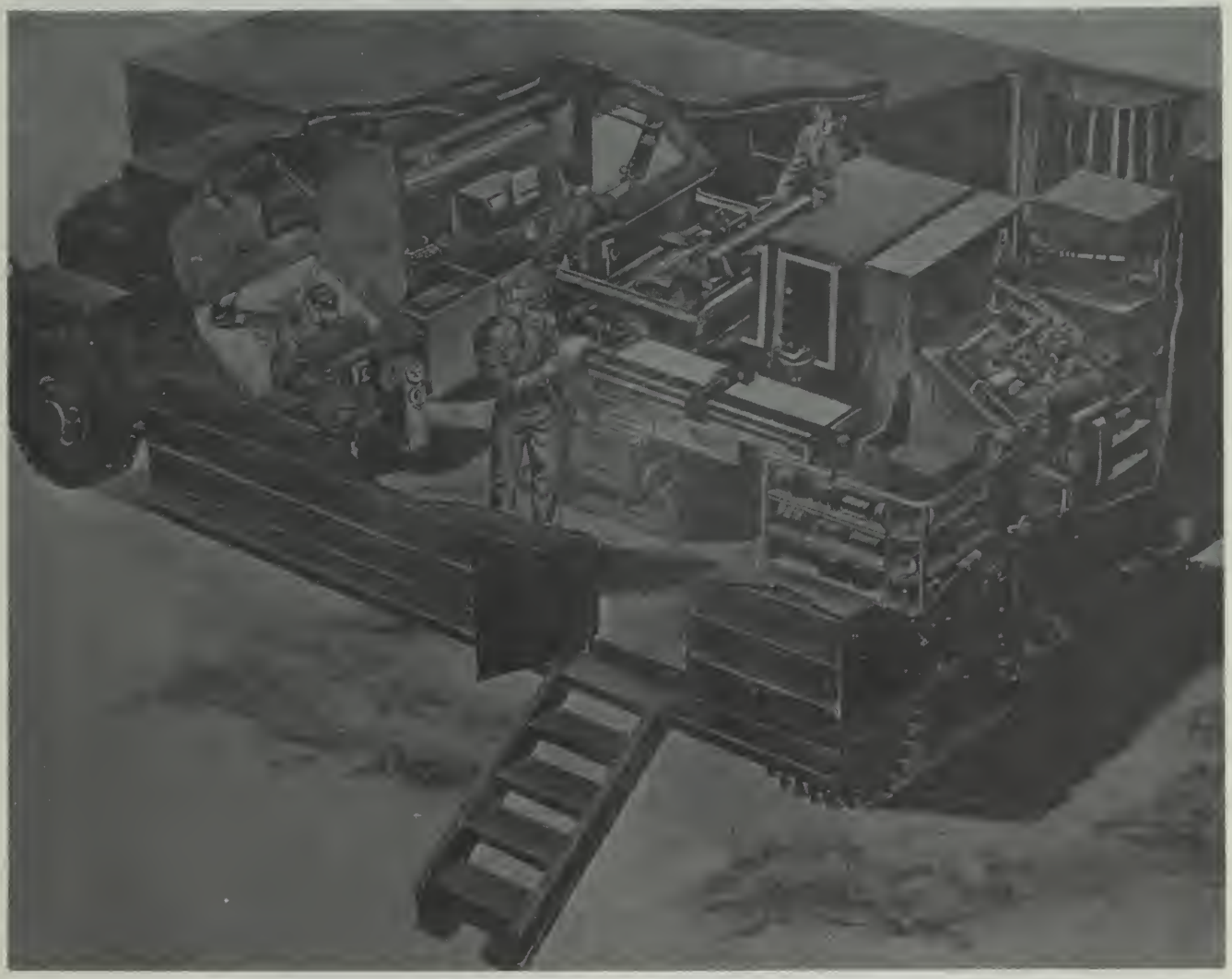
This problem of timeliness is multifaceted and should be examined in detail to determine where the problem areas lie. The first problem is crew/platform response/reaction time. Generally speaking, no aerial reconnaissance system will be adequately responsive to the normal tactical needs of commanders below corps level if its total response time must be considered. This then leads us into a very necessary assumption that the collection platform must be operating in or near the area of interest prior to its being tasked. While the remainder of this timeliness analysis leads off from this basic assumption, and we will not dwell on it to any length, it must be understood that a considerable amount of effort in concepts, development, funding/procurement, planning, and operations must be expended for this assumption to be valid. We in CDC have a very large stake in just this aspect of the problem. It's not just enough for us to prove a concept and field a workable item. We must adequately justify its needs so that sufficient quantities will be procured to satisfy the mission requirements. We cannot abdicate our responsibilities to the ever-present budget cutters.

The next problem area in timeliness is the type sensor used, since it is practicable to data link only electronically sensed imagery. This has two immediate implications. First, conventional photography may not be timely below field army level. Secondly, technological efforts have not yet produced electronic/video sensors which consistently detect personnel and small OB equipment. However, since imagery must be data linked, the electronically acquired imagery must be used to satisfy these requirements. This can be accomplished within the 75–80 time frame by combining improved current state-of-the-art sensors (TV, SLAR, IR) with emerging state-of-the-art sensors (multispectral, laser), and employing them in the requisite flight profiles in survivable platforms. The data links involved should be relatively simple for two primary reasons. First is size—since it needs to be kept small for size/weight considerations. The other is bandwidth transmission—the narrower (simpler) the transmitted bandwidth, the smaller, less complex, less costly are the antenna and receiving portion of the ground sensor terminal.

Acquisition of a realtime or near realtime (delayed no more than a few minutes) image on the ground provides timely "information" but does not provide timely "intelligence." Processing information into a finished, disseminated intelligence product has generally been more time-consuming than the aforementioned collection phase. For example, in Vietnam even without data link, immediate imagery interpretation reports took an average of two to three days to reach the tactical requestor!

At this point, a potentially dangerous pitfall emerges as an obvious alternative to this apparent delay due to the analytical and dissemination process: namely, to place the realtime receiver terminals in the supported unit's TOC. The resultant imagery/data is raw material, completely unevaluated. The problem here is that the commander will want to react to it prior to its being evaluated (processed). This causes wasteful expenditures of effort on false alarms, with one final result being the creation of a credibility gap between the commander and his intelligence sources.

Under our current operational concepts, the data-linked imagery is first read out by a sensor operator who is not an intelligence specialist. Assuming he notices and quickly grasps the significance of some enemy activity, he then must manually (via telephone, radio, message) transmit his interpretation of this data to a G2 Air, or possibly to an OB specialist, who may then give it to an operations officer or possibly relay it directly into a fire direction center. The point is that two, three, or more manual transactions



Tactical Image Interpretation Facility—AN/TSQ–43

must take place before the raw data is analyzed and given to someone who can effectively use it. Add to this the usual communication link problems and each individual's interpretation of the event, especially considering that probably only one individual in the chain is intelligence trained, and one can readily imagine what happens to timeliness—it's gone!—maybe by a matter of minutes, usually by a matter of hours, often by a matter of days.

Current Actions

Let us now review some current materiel and doctrinal actions under consideration. The list is not all-inclusive nor is it in order of priority. It contains the major actions impacting on aerial reconnaissance and surveillance. Space and security considerations limit descriptions, but hopefully the scope of the effort, cost implications, and redundancies will emerge.

—Unmanned Aerial Vehicle for Surveillance (UAVS). A high-speed relatively long-range drone that would carry a variety of sensors on penetration missions.

—Tactical Moving Ground Target Detection System (TMGTDS). A manned helicopter carrying a moving target indicator radar.

—Joint In-Flight Data Transmission System (JIFDATS). A data transmission system that would receive and transmit all types of imagery, IR, SLAR, and photography, from the services' tactical reconnaissance aircraft.

—Tactical Imagery Interpretation Facility (TIIF). An advanced imagery exploitation and dissemination facility.

—Tactical Imagery Processing Laboratory (TIPL). An advanced photographic processing and reproduction laboratory.

—Foliage Penetration System (FOLPES). Sensors, either infrared or radar, airborne or ground, that possess the ability to penetrate foliage cover.

—Unmanned Aerial Surveillance System (UASS). A remotely piloted platform capable of hover flight.

—Manned Aerial Vehicle System (MAVS). A manned aircraft that would be a follow-on to the OV–1D.

—Multispectral sensor systems. Primarily electro-optical sensors using portions of the electromagnetic spectrum not covered by current sensors.

—Airborne Target Location System (ATLS). A helioborne target location system that combines a visual sensor with a laser designator.

In addition to these systems, the Intelligence Agency is writing or has under consideration, required operational capabilities for 17 other systems to include space platforms and ground sensors such as radars, night observation devices, and unattended ground sensors.

In the organizational/doctrinal field, one development deserves special mention—the Division Target Information Battalion (TIB). The concept calls for a division level unit composed of a HQ company, an aerial surveillance company, and a ground surveillance company. The mission of the TIB is to provide management, specialist personnel, and equipment for the collection, processing, and dissemination of combat intelligence information obtained or developed in support of the division. The TIB provides aerial and ground surveillance support to the division to collect information on enemy activities. It provides the BICC at division level to coordinate the collection effort, analyze information, and produce and disseminate intelligence. Similarly, BICC will be provided to maneuver elements of the division. Elements of the TIB are capable of interpreting sensor and photographic imagery, performing short- and long-range attended ground sensor surveillance, and unattended ground sensor monitoring. Thus, the TIB will combine all the various elements of the surveillance and reconnaissance system, with the inherent capability to accomplish all the functions of the intelligence cycle as they pertain to that system.

FASTAR Study

Of signal importance is a recently initiated study of the "Family of Army Surveillance and Target Acquisition Requirements (FASTAR). This study should go a long way toward putting all the various parts of any reconnaissance and surveillance system together so as to enable us to adequately assess the complete effectiveness of that particular system. While it has just been started and will not be completed until June 1973 at the earliest, some preliminary results merit mentioning. The objectives of the FAS TAR Study are as follows:

a. To review and evaluate the requirements for current and future manned and unmanned aerial reconnaissance, surveillance, and target acquisition (RSTA) systems.

b. To determine the ability of both current and future aerial systems to perform RSTA missions in both the penetration and nonpenetration roles.

c. To determine subjectively the survivability of these systems in the hostile environment of a mid/high-intensity conflict in Western Eu-

rope, to include the enemy electronic warfare (EW) threat.

d. To identify equipment and systems in existence and under development for which a valid requirement does not exist.

e. To eliminate unnecessary duplication of effort.

f. To determine by subjective analysis the cost effectiveness of proposed manned and unmanned aerial RSTA systems and recommend the most economical and combat effective mix of these systems.

g. To determine to what degree the adoption of electronic and nonelectronic countermeasures improve the probability of survival of the selected systems.

h. To surface problem areas, define capabilities, and identify shortfalls in Air Force support of the Army RSTA effort.

i. To propose a systems approach to guide developers in the research and development of aerial RSTA systems which will meet the needs of the Army and eliminate unnecessary redundancy.

The first working group met in May, and while their purpose was to recommend a study outline, define and consider various limiting factors, and establish parameters for the study, some preliminary findings are already apparent. No current aerial surveillance systems provide adequate target acquisition data to commanders below division level—again, lack of timeliness. Even with our ground sensor terminal associated with the OV–1 system, this timeliness problem has not been overcome. Concurrently, we are also discovering that there are several developmental actions under consideration which would provide unnecessarily redundant coverage of some areas, while probably not fully satisfying the apparent gap. Examples of these systems are: Unmanned Aerial Vehicle for Surveillance (UAVS), Tactical Moving Ground Target Detection System (TMGTDS), and the Airborne Target Location System (ATLS).

As previously cited, it is apparent that the Air Force cannot satisfy Army needs below field army level primarily due to unavailability of aircraft and no compatible data-link capability. Finally, the problem of survivability is assuming considerable importance for two reasons. First, while some survivability data is available, no comprehensive studies have been prepared on our existing or proposed systems to really nail down this very vital problem. This impacts on the second reason, in that the primary rationale for an unmanned system is based on its inherent characteristic of survivability in a hostile environment—unattainable for manned aircraft. Therefore, until this survivability problem is settled, it will be impossible to determine the exact role an unmanned vehicle will play.

Along with these preliminary findings, it is also appropriate to consider some preliminary recommendations. It is obvious that the subjective analysis dictated by the study limitations is insufficient to adequately address the survivability problem. Therefore, more extensive survivability studies by computer simulation and actual fly-offs, where possible, are required. Redundant systems must be identified, examined, and recommended for elimination from consideration for further developmental effort. A system that will cover apparent gaps must be identified and its development expedited. Finally, the magnitude and complexity of this aerial surveillance problem seems to indicate that a standing reconnaissance and surveillance board should be established to provide direction and coordination for the Army's aerial reconnaissance and surveillance efforts.

In Summary

It is increasingly obvious that this systems approach toward aerial reconnaissance and surveillance is the only way to go. We are on the right track for the first time. The resultant systems may vary somewhat from those currently under consideration. However, the substantive data derived from systems oriented studies and/or requirements documents will fully support the systems finally fielded. The combat commanders will know that they will have the best aerial reconnaissance and surveillance systems available—systems that will provide them the timely target acquisition data heretofore unavailable from aerial surveillance means.

LOOKING AT THE FUTURE BY STUDYING THE PAST

Mr. Jean Keith—Combat Developments Command's Chief Historian.

When one thinks of the United States Army Combat Developments Command, he thinks of the Army of the Future. That is the purpose of CDC—developing our future Army. But there are a few in CDC who dwell on the past.

Those few who work with the past rather than the future are the CDC historians. Their mission is to record all that goes on within the entire Command. For such a large task, CDC has only five professional historians. The historical staff for the Command consists of two professional historians at Headquarters, and one each at the Combat Systems Group (COMS GP), the Personnel and Logistics Systems Group (PALS GP), and the Combat Developments Experimentation Comamnd (CDEC). In addition, some 22 historical officers, working only part-time, submit an input at the end of each fiscal year to the annual historical summary from each major element of the headquarters and from those subordinate commands which do not have a professional historian. This input in itself is no easy task, but the historians who must combine all the input for the permanent record face a tremendous task. If anyone has had to do extensive work on the final writing of a Materiel Need (MN) document and thinks that is a great task, he should try putting together an historical summary which summarizes all the MNs done during the whole year in addition to other business of CDC.

The role of the professional historian in the United States Army goes back to the late 19th century with the publication of the voluminous

War of the Rebellion records. Next came a publication of key documents from World War I. These efforts involved the exact reproduction of documents, not the production of an analytical narrative. At the beginning of World War II, President Roosevelt and Prime Minister Churchill came to the conclusion that the German General Staff was gleaning valuable lessons from the analytical military history program which Germany had maintained during World War I and afterwards. The United States and her allies, in contrast, were denied the clues and signposts which such a program could furnish. For a short time, a small War Department historical office was put into operation. This office provided isolated studies. Then General Eisenhower, an assistant to the Chief of Staff, called in the Chairman of the History Department of the Johns Hopkins University to discuss forming a comprehensive and ambitious historical program. Dr. Greenfield of John Hopkins, after receiving a commitment from General Eisenhower that his historians would be allowed to "call the shots as they see them", set about to obtain an objective and accurate narrative coverage of the War Department at home and overseas. A series of volumes on World War II and the Korean War resulted, as well as individual unit histories of combat actions overseas and a continuing coverage down to the present time of the accomplishments and problems of agencies and commands within the Continental United States.

The responsibilities of the Office of the Historian at CDC, under the current Army program, are two-fold. Army regulations stipulate that CDC will insure the maximum use of military history as guidance in developing changes to current doctrine and in formulating new doctrine. This aspect of the job is necessarily unpredictable and must be fulfilled as the needs arise. On the other hand, CDC is also responsible for historical monographs and studies as scheduled in the Army Historical Program, revised each year by the Office of the Chief of Military History, Department of the Army. The CDC historians must also prepare an annual summary of the operations of the entire Command.

CDC's Chief Historian is Mr. Jean E. Keith. He is responsible for CDC's entire historical program. In his office in the Command Presentations Directorate of CDC Headquarters, he is assisted by Dr. Howard K. Butler, Historian, and Miss Sherry Lang, Editorial Clerk. These three people are constantly at work keeping up with the operations of all of CDC. It is their job and the job of the historians at COMS GP., PALS GP., and CDEC to see that the daily activities of CDC are recorded for future use.

CDC relies on history in designing the Army of the future. By looking at the Army of the past, CDC sees what did or didn't work and can apply that information to present projects. To illustrate the scope and variety of the projects that the small historical staff can undertake, one needs only to look at some of its completed projects. For the first two years after the organization of CDC the two historians at headquarters concentrated on the first half of the historical mission—furnishing urgently needed historical background information and experience factors to various *ad hoc* committees.

The first such project was a comprehensive historical review of all varieties of fire support since 1941 for the CDC study, "Army Requirements for Fire Support". This study was undertaken by a group headed by Major General Jonathan O. Seaman. The historical review of firepower became an appendix to the study published in April 1963.

In May 1963, the historians provided a similar document, "Historical Summary of Direct Fire Weapons in World War II and the Korean War", published as Vol. VII of the "Army Requirements for Direct Fire Weapons Systems" (ARDFIRE).

The third major project was support for OREGON TRAIL. This included about a dozen small studies of wide variety such as artillery ammunition and bomb procurement during World War II, proportion of casualties in World War II and in the Korean War attributed to fragmentation and to small arms fire, number of Allied and German divisions on the Western Front at spaced intervals during World War II, and the percentage of refugees during the Korean War who were agents, saboteurs, or other clandestine types. In addition, the Historical Office prepared for OREGON TRAIL a major substudy in monograph form entitled "History of Restraints and Limitations in Warfare: From Ancient Times to the Atomic Age."

As Fiscal Year 1964 drew to a close, it was apparent that although the work which had been done was profitable, still the whole mission was not being accomplished. Unprogrammed proj-

ects had absorbed all of the time of the two historians. The CDC Chief of Staff felt that the monographs and studies could be postponed for a while longer but that the annual historical summaries required by AR 870–5 must be started. Accordingly, appropriate historical directives established the requirements and procedures for the submission of annual feeder reports by headquarters and field elements.

In December 1965, the Historical Office completed the first of these summaries, a combined report for Fiscal Years 1963 and 1964. Designed to provide a documented, readable, narrative record of the principal achievements and problems of CDC which would be of continuous usefulness to the command in connection with future determinations of policy for management and operations, it also serves as orientation material for newly assigned personnel. Subjects included were the 1962 re-organization of the Department of the Army, planning the functions and organization of CDC in early 1962, creating the command, and an account of two full years of operations. Two subjects treated in depth were tactical air mobility and tactical nuclear warfare. Six of these annual histories are now published, through Fiscal Year 1969.

In addition to publishing the annual historical summaries, the Historical Office developed a special project, the CDC Pamphlet 870–1, "Military History Reference Guide." This pamphlet, revised periodically, furnishes a brief listing of the more useful historical policy references and guides to better writing. It names and locates the current historians and historical officers of the command, and sets forth the annual historical program. It also lists and describes briefly the historical summaries, studies, and monographs compiled within the command or by contract which are available upon request for short-term loans.

To augment the capabilities of the Historical Office, the headquarters in 1964 authorized a series of organizational studies to be written on contract by the Combat Operations Research Group. This series of eight studies, completed between January 1965 and October 1969, covered the historical evolution of various types of units, from squad, through battalion, to division.

Meanwhile, the three historians at subordinate commands continued some work on programmed requirements. In June 1967, the historian at PALS GP prepared a monograph, "Combat Service Support for the Army in the Field, 1953–1965." The historian at CDEC has prepared two monographs: the "History of Field Experimentation Methodology in the United States Army" and "Questions Answered Through Field Experimentation". In addition, CDEC published in 1965 and 1970 a two-volume history of CDEC—one covering the period 1956–1964, and the other covering the period 1964–1969.

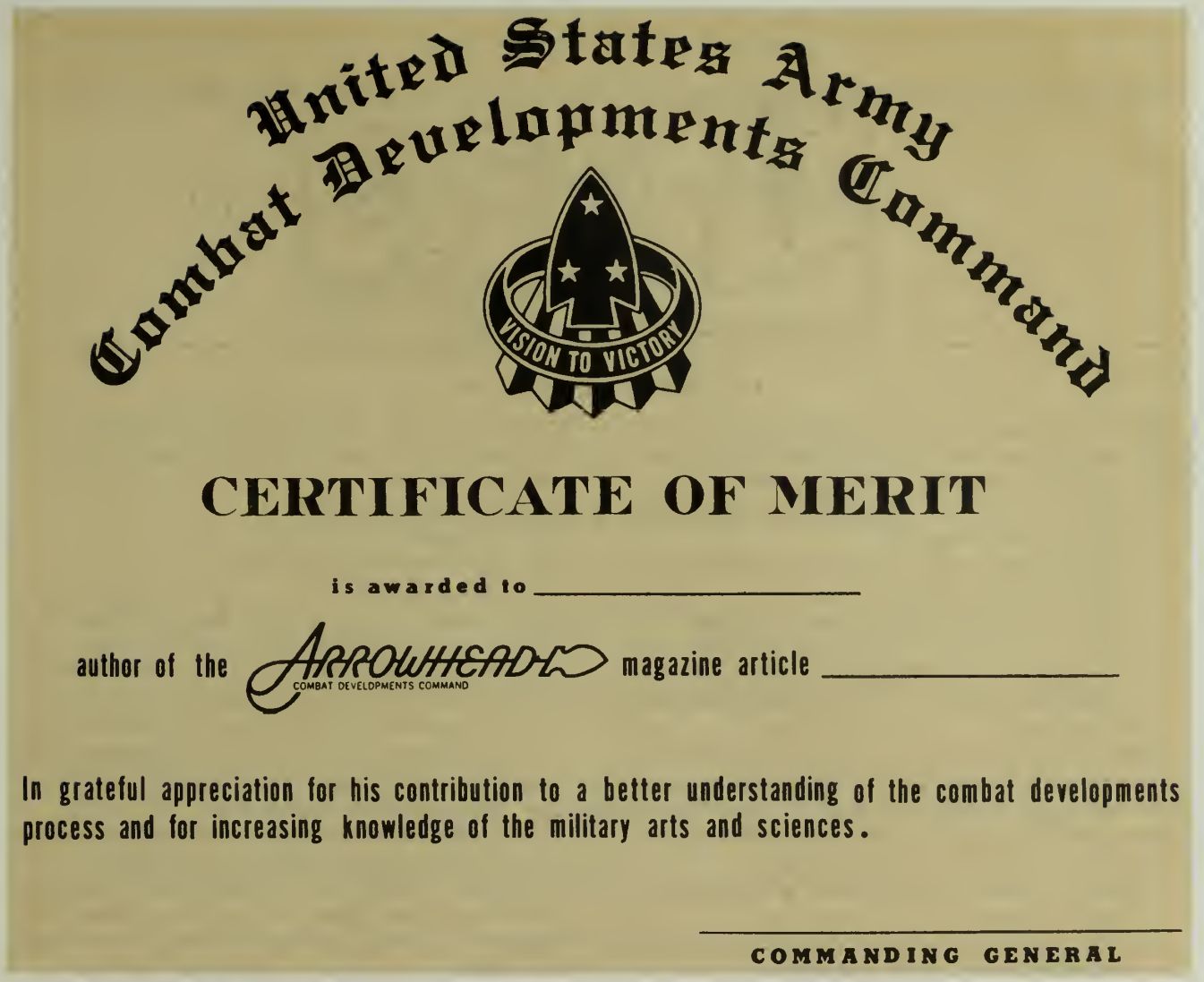
In 1969, the historian at COMS GP published a monograph, "The Origins, Deliberations, and Recommendations of the US Army Tactical Mobility Requirements Board", written from the files accumulated by the Howze Board at Ft. Bragg, N.C.

Although the emphasis since 1964 has remained upon programmed requirements, some unprogrammed requests have been answered. The nature of the request and the amount of time available dictate the format of the answer. As an example, in 1965, the Historical Office prepared for the Commanding General a short narrative in reply to his request for a summary in such sufficient detail that extracts could be used in speeches showing why the armored concept was not fully accepted and put into practice in the British Army before World War II.

In contrast, in answer to another request, the historians sent an extensive collection of extracts from numerous sources to the CDC Liaison Officer, U.S. Army Pacific, showing examples of the use of tanks in Southeast Asia. These extracts became the main source for an article in the *USARPAC Intelligence Bulletin* on the possible use of armor by the Communists. Another such collection of extracts, made in 1967 for the 9th Division in Vietnam, concerned historical precedents for riverine operations. Two others, in 1968, for PALS GP, covered combat area smoke screening in the Korean War and the tactical employment of air defence automatic weapons against ground targets in Korea.

Other requests, for which there has been too little time to do even this much research, have been answered by furnishing detailed references to sources.

It is easily seen how effective the Historical Division can be. Through the efforts of this small but efficient group of individuals, CDC is better prepared to design the Army of the Future. It is indeed a good thing that some people in CDC dwell on the past to design the future.



ARROWHEAD AWARD RECOGNIZES AUTHORS

What is the reward for writing articles that may be of interest to thousands of people? How is the writer reimbursed for the time spent in researching, organizing, and writing an article? Is it in the pleasure of seeing the article in print? Is the reward in the recognition that one gains by writing an article of interest? Is the reward in some form of monetary reimbursement?

Writing articles for publication can be rewarded by all of the above ways. Many magazines buy articles at so many cents per word, or page. One will recall the June issue of *Arrowhead* which explained how the US Army feels about monetary renumeration for articles written during official duty time. Nevertheless, the author of an article deserves recognition for the time and effort put into an article for publication. The *Arrowhead* has recognized this fact and has instituted the awarding of a certificate of merit to those who have contributed their articles to us for publication. This may just be a small way of saying thank you, but to the author it means that his efforts are appreciated.

CDC's Commanding General, LTG John Norton, will sign the certificate of merit and send it to the writer's supervisor or commanding officer for appropriate presentation.

The certificate of merit award for articles published in the *Arrowhead* went into effect with the July issue and will be presented to each author who submits an article to the *Arrowhead* and has it published. The *Arrowhead* appreciates all those who take the time and effort to submit articles for publication and believes that the certificate of merit is one way of showing our appreciation to them.

If you would like to receive the *Arrowhead* certificate of merit, send us your articles for publication in the *Arrowhead*.

The Point of the Arrow

OCTOBER QUESTIONS

1. Hybrid engines combine the best features of spark ignition and compression ignition engines. Which of the statements below is correct?
   A. They represent a radical design departure from existing engines.
   B. They depend solely on air throttling for their acceleration.
   C. They will eventually be the propulsion mean for all ground and air vehicles.
   D. They can be optimized for either maximum fuel economy of minimum exhaust emissions.
2. Significant advancement in optics and individual vision aids has occurred in the past several years and is of distinct interest to Department of Army and CDC for military application. This advancement relates to: (select one).
   A. Hard contact lenses made of glass-base type materials.
   B. Soft contact lenses made of non-rigid materials such as silicone rubber.
   C. Hard contact lenses made of rigid and semi-rigid materials such as plastic.
   D. Soft contact lenses made of pliable materials such as plexiglass.
3. Which of the following are advantages to be obtained by the use of soft recoil technology on a cannon system?
   A. Increased mobility.
   B. Increased rate of fire.
   C. Decreased maintenance.
   D. All of the above.
4. In nuclear power plants the potential of a breeder reactor is that:
   A. It provides both a terminal power source and new fissionable material.
   B. It provides direct current electricity whose voltage can be regulated by breeder rods.
   C. It provides either output power or fissionable material but not both.
   D. It provides alternating current electricity without the need of a commutator.
5. Present technology is capable of developing a thermal night sight scope (less coolant and batteries) for use with a rifle that will weigh less than:
   A. four pounds
   B. eight pounds
   C. twelve pounds
   D. twenty pounds

SEPTEMBER ANSWERS

1. The use of professional historians to record the history of the United States Army began in what year? The first historical effort for the military began in 1874 with the compilation of the War of the Rebellion records. However, the current historical program of the Army had its beginning in the early 1940's.

2. What are the four "mission type" directorates at CDC Headquarters? The four mission type directorates are the Directorate of Organization, the Directorate of Test and Evaluation, the Materiel Systems Directorate, and the Directorate of Concepts and Doctrine.

3. What has replaced the Materiel Need document effective August 1972? The ROC, Required Operational Capability, replaced the MN.

4. Who has the authorization to recommend changes to any Army field manual? Anyone who uses Army field manuals is authorized and encouraged to recommend changes and corrections to Army field manuals.

5. Radars can be divided into two general types: continuous wave and pulse.
Which of the following is an advantage of the continuous wave radar?
a. can see moving targets in "clutter"
b. permit easy determination of range data
c. provides more accurate azimuth information
d. is less susceptible to electronic countermeasure

Commander's Call

Keep our POW's and MIA's in your Prayers

There are many poignant stories about the families of our prisoners of war and missing in action. Many of these incidents deal with the terrible vacuum of silence with which their loved ones must contend on a daily basis. Here is a touching story that recently came to our attention:

Five years is a long, long time to live not knowing if your husband is dead or alive. For a little son who has never seen his father it is forever. The task of raising him alone and trying to explain what it means that his father is a prisoner of war becomes more difficult with each passing month.

Carole Hanson is one of the mothers who face this task daily. She does so with outstanding religious faith and hope. Still sometimes her faith wavers. It happened recently on a dull, rainy morning. But Todd, her five year old son, came running to her. "Come see what I've made!" he cried. Carole followed him.

Proudly Todd showed a house he had built with his blocks. Then he lifted off the roof. Inside was a plastic soldier. "There's daddy," he cried triumphantly.

Caught off guard, Carole felt her eyes fill with tears. Todd was dismayed. He grabbed her hand and pressed close to her. "Don't feel bad, mommie," he comforted, "God's there too."

O God of our Fathers who from generation to generation has watched over us in love, hear us now in our time of perplexity and need. We pray for our comrades who are prisoners of war and missing in action. They have borne the brunt of battle, endured the anguish of pain, imprisonment and loneliness, and we have too often forgotten their sacrifice. The callousness and coldness of our hearts distress us, O God, and we pray that you will forgive; rekindle within us as individuals and as a Nation a renewed dedication and commitment to those gallant men who have suffered so much.

Now we pray that they may not feel forsaken, but that they may know the certainity of Your love and Your presence, never doubting in the present darkness what You have told them in the light. Let not the flame of hope go out in their hearts but hasten the day when their burden will be lifted and they will be restored to their homes, their loved ones and freedom. Amen.

The Forum

Editor
Arrowhead
USACDC
Fort Belvoir, Virginia 22060
Sir:

Just a note to express my appreciation of your magazine, the first issue of which (No. 42, Aug 72) I just browsed through. It does something too many military magazines fail to do; i.e., it is informal enough to avoid the coldness of formality, yet formal enough to keep its dignity—a fine balance indeed. I think some of the product must rest upon the copy itself: it is light in weight and, thank God, *not* slick paper that is so infamous for its glare property. But beyond that you are due, as staff and literary makers, high praise for the message as well.

W. T. Burkett
GS–12, Educ Sp

Literature Division, DDL&P
USAAVNS (ATTN: ATSAV–DL–L)
Fort Rucker, Alabama 36360

The United States Army is not the only one interested in combat developments. The following article shows how another country feels about the value of combat developments:

"Scientific prediction and forecasting play an important role in the development of weapons and combat equipment. Particularly now, when, in the opinion of foreign specialist, the depth of forecasting in the military sphere is being considerably increased, military science must look ahead and, in accordance with this, develop design targets for the creation of promising new combat equipment and weapons. This makes it possible to reduce the time spent on the creation of new weapons systems. Scientific prediction under contemporary conditions is impossible without understanding and employing the latest achievements of science and technology, particularly mathematical research methods and computer means. Mathematical methods bring good results not only in the field of assessing the expected effectiveness of weapons and equipment but also in the field of strategy—in assessing the possibilities of troops groupings, in finding the optimal variants for their operations, and in organizing the control of troops. These methods make it possible to look into the future with great certainty and facilitate understanding of the quantitative grounds for scientific prediction. For instance, the reproduction of the model of a battle on a computer makes it possible to count the number of its variants and choose the best, optimum variant."

Lt. Gen. I. Zavyalov in KRASNAYA ZVEZDA, Military Daily of USSR Ministry of Defense 3 Aug 72

Spot Reports

Laser at AUSA

Ft. Belvoir, Va. . . .

The unique laser device used in developing the helicopter-launched TOW missiles into deadly tank-killers in Pleiku and AnLoc was featured in the Combat Developments Command "laser firing range" at the 18th annual meeting of AUSA.

Shown above is General Bruce C. Clarke (RET) firing the laser device mounted on the M–16 rifle.

To replace human observers and umpires in tactical experiments, the Combat Developments Command (CDC) couples a laser beam with a computer to produce reliable combat data at its Experimentation Command at Ft. Ord, California.

Using laser pulses and sensors to "umpire" two-sided battles, the system, called Direct Fire Simulator, played a key role in adapting the TOW missile to a helicopter to create the deadly tank-killer which recently appeared in Vietnam.

The helicopter-TOW crews who recorded 47 airborne kills in places like Pleiku and AnLoc, developed their tactics on the command's "live chessboard" at Hunter Liggett Military Reservation south of Ft. Ord.

Using the "large gun" laser (as compared to the man-portable system), the choppers got their first kill-data from the sensors mounted on the real tanks they "attacked" on the California terrain. These tanks could fire back at the TOW-choppers—also with harmless laser beams.

Sensors or detectors on tanks, helicopters and Soldiers hit by a laser beam in the "battle" area set off a smoke, light or buzzer signal while reporting the time, place and potential damage to a computer which resets them for continued action.

Ladies' Day

Ft. Monmouth, N.J. . . .

With Army wide emphasis on VOLAR and "people" communications, the Combat Developments Command Communications-Electronics Agency recently launched the first of a series of programs geared to acquaint the wives of the agency members with unit functions and the importance of their husbands' duties. This first event, hosted by COL and Mrs. James P. Mattern, was a thorough orientation on the agency, its mission, functions and major ongoing projects. Informal briefiings were presented by COL Mattern, the agency Commander and LTC Edwin H. Turner, Operations Officer. Included in the "ladies day event" was a guided tour throughout the agency where wives were given an opportunity to observe their husbands at work and to meet with their husbands' co-workers.

Your Job Too

Ft. Belvoir, Va. . . .

The United States Army Combat Developments Command uses many ways of getting out the word on CDC. Telling the CDC story is a vital function as the Army moves into an all-volunteer status. With a smaller, more professional Army, the Army Combat Developments Command will carry much of the weight in the new Army. What is done at CDC by each directorate, agency, and group could have significant effects upon the modern Army.

The CDC story must be told—and it must be told to everyone. The ways in which it is now being told are many. First, the CDC Army of the Future Briefing Team travels all over the world telling the story of CDC—what it is, how it works, and what it does. The *Arrowhead* magazine is another means of getting the CDC story told. The magazine goes to all battalion size elements, all Army ROTC units, many industries, and to major command elements.

The Command Presentations Directorate at Headquarters must see that the CDC story is told. The members of the Information Branch and the Presentations Branch employ various communication methods to tell the CDC story. News releases are sent to civilian newspapers and military newspapers and magazines in an attempt to get the word out. The Presentations branch gives briefings to visiting groups and individuals on the important role that CDC plays in today's Army. The task is great, but the CDC story must be told. And *you* can get involved.

If you are in CDC, you are responsible for telling the CDC story. You can do this by sending in your ideas about CDC and writing articles about the work you are doing. The CDC members at other posts are interested in what the rest of the Command is doing but usually they do not know what is going on because the word has not been put out to them. You can help them and the Information branch of the Command Presentations Directorate by giving us your ideas for articles, news releases, etc. If *you* do not tell us what you're doing, we cannot tell others. Command information is everybody's business—not just the Information Officer's.

If you think you have the foundations for an article of interest to the rest of the Command, let the Headquarters Information Officer know about it. You don't have to be a professional writer to get your article in print. The professionals at the Headquarters will do the writing. We need you to do the leg work. We can not travel to all the agencies and groups to find out what is going on. We need you to tell us that. Once we have the facts, one of the writers in the office can turn it into an article that may help to tell the CDC story.

A lot of hard work goes into the processing of new ideas in CDC. The group, committee, or task force with which you have been working should get some recognition. Let us know what you are up to. Let us tell the rest of the Command about the good work being done by your agency, group, or directorate. We can help you, if you help us. Send your ideas for articles to:

Commanding General
United States Army Combat Developments Command
Command Presentations Directorate
CDCCP–I
Ft. Belvoir, Virginia

Hodson Visits CEA

Ft. Monmouth, N.J. . . .

Brigadier General Fremont B. Hodson, Jr., newly appointed Commanding General of CDC's Intelligence and Control Systems Group, recently made an initial visit to the CDC Communications-Electronics Agency at Fort Monmouth, New Jersey. BG Hodson received briefings on agency operations and also visited the US Army Electronics Command, the US Army Signal Center and School and other major activities on post. The new Group Commander took over duties at Fort Belvoir early this month after completing a tour as Chief of Staff, HQ III Corps, Fort Hood, Texas. Above, center, BG Hodson listens intently as COL James P. Mattern, CEA Commander, right, discusses on-going projects. At far left is COL Paul E. Nottage, INCS Group Chief of Staff who accompanied BG Hodson during his two day tour of Fort Monmouth.

New Deputy CO

CARLISLE BARRACKS, PA.—Colonel Joseph E. Pizzi (above) was recently named Deputy Commander of the US Army Combat Developments Command Strategic Studies Institute at the US Army War College, Carlisle Barracks, Pa.

A native of Clairton, Pennsylvania, Col. Pizzi began his career as an Army officer in 1942. During World War II he served consecutively as a Platoon Leader, Executive Officer and Company Commander with the 2nd Battalion, 338th Infantry, 85th Infantry Division.

Following the war, he attended Duquesne University, Pittsburgh, earning his Bachelor of Science degree in Business Administration in 1948. He returned to combat duty in 1950 serving as Intelligence Staff Officer, Headquarters Eighth US Army, Korea. He has since served in a variety of assignments including tours in Japan, Germany and the Republic of Vietnam. Highlights of his 30-year career include assignments as Professor of Military Science and Technology, Kent State University, Ohio and Army Advisor to the US Air Force Air War College, Maxwell Air Force Base, Alabama.

In 1965 he graduated from the US Army War College and also was awarded a Masters degree in International Affairs from George Washington University. He returned to Carlisle Barracks and the Army War College in 1969 to be named Director of Strategic Studies of the Combat Developments Command Institute of Advanced Studies which was later changed to Strategic Studies Institute.

He held this position until Aug. 1971. Prior to his return to Carlisle Barracks in Aug. of this year to take up his new assignment, he served as Chief of Staff, Headquarters 2nd Regional Assistance Group, Republic of Vietnam.

New SA at CDEC

Ft. Ord, Calif. . . .

Brigadier General Ray Ochs, commanding the Army Combat Developments Experimentation Command headquartered on Fort Ord, announced the addition to his personal staff of Dr. Marion Bryson, who replaces Walter Hollis as Scientific Advisor for the command. Mr. Hollis is now attending the National War College at Fort McNair in Washington, DC.

Dr. Bryson comes to CDEC from the Systems Analysis Group (SAG) at Fort Belvoir, Virginia where its parent unit, (and CDEC's) the Army Combat Developments Command, is located.

A former Duke University Medical School professor, Dr. Bryson was SAG's principal contact with the scientific, professional and academic communities as the Group's Technical Director and was also in charge of the assignment, conduct and approval of SAG technical study projects supporting the CDC Army development program.

While at Duke, he taught and researched in the fields of mathematics, statistics and operations research.

Earlier in his academic career, Dr. Bryson taught at the University of Idaho, Drake University and at Iowa State University. He holds bachelor and masters degrees in mathematics from the University of Missouri and a PhD in statistics from Iowa State.

His activities in the military have included physical inventory, control, reliability theory, experimental design and mathematical models.

Since 1963, he has been Program Chairman and General Chairman of the Army Operations Research Symposia and has served on its Board of Directors, currently occupying the position of 1st Vice-president. At Duke, he worked extensively with the Army Research Office—Durham, under contract.

Dr. Bryson has published technical articles in numerous American and British journals in the areas of operations research, medical statistics and sampling methods.

His past community activities have included participation in the Toastmasters International (North Carolina Chapter), Lieutenant Governor from 1967–1968; the American Cancer Society of which he was Vice President of the Durham County Unit, 1966–1968; and Parent-Teachers Association activities.

Commanding General	**LTG John Norton**
Director, Command Presentations	**COL George H. Hallanan, Jr.**
Information Officer	**LTC Gerald D. Hill, Jr.**
Editor	**LT Robert H. Gregory**
Production Editor	**LT Gary R. Steimer**